

### REMARKS/ARGUMENTS

Claims 1 and 27 have been amended and support can be found in the specification at, *e.g.*, page 8, line 9 to page 9, line 7; page 23, line 29ff.; and at page 29, lines 36-41. Claim 42 has been newly added. Support can be found in the specification at, *e.g.*, page 4, lines 6-12.

No new matter has been added.

#### Rejections

1. The 35 USC § 103(a) rejections: i) of claims 1, 3-7, 19-20, 24-26, 30, 33, 38 and 41 as being unpatentable over *Ruhlmann* in view of *Rosenbusch*; ii) of claims 9, 11-12, 20 and 27-29 as being unpatentable over *Ruhlmann*, *Rosenbusch* and *Fennen*; iii) of claims 35-37 as being unpatentable over *Ruhlmann*, *Rosenbusch* and *McHugh*; and iv) of claims 34, 39, and 40 as being unpatentable over *Ruhlmann* and *Rosenbusch* are each respectfully traversed.

Claim 1 has been amended to include limitations of claim 38, which claim was not included in rejections ii)-iv), above. Accordingly, these rejections are moot.

There is no motivation to combine the cited references. *Ruhlmann* discloses a class of dyes known as reactive dyes that are reactive to leather and can applied to leather in floats.<sup>1</sup> Reactive dyes bond to, *e.g.*, celluloses by a chemical (covalent) bond.<sup>2</sup> *Rosenbusch*, on the other hand, relates to methods of dyeing leather with acidic and basic dyes. The leather surface must be cationic to be dyed with acidic dyes and anionic to be dyed with basic dyes. See the first three paragraphs of the English translation of *Rosenbusch* filed on February 24, 2011. See also the enclosed Wiki sheet for acid dyes, where the bonding between dye and substrate is ionic.

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<sup>1</sup> See column 1, lines 5-7 of *Ruhlmann*.

<sup>2</sup> See the enclosed Wiki sheet for reactive dyes.

The chemistries between *Ruhlmann* and *Rosenbusch* are therefore different and require different dyes for the dying to be performed. Accordingly, there is no motivation to combine the cited references.

The cited references, individually or combined, also fail to disclose or suggest all elements of the claims. As conceded by the Office, *Ruhlmann* fails to disclose or suggest the claimed pHs at which the claimed processes are carried out.<sup>3</sup> In fact, *Ruhlmann* discloses highly basic conditions for dyeing fabrics in the Dyeing Instructions disclosed in column 14 of this cited reference, as large amounts of sodium hydroxide and sodium carbonate are added to the dye floats. There is no teaching, suggestion or motivation in *Ruhlmann* to conduct the dyeing at lower pHs, such as those claimed.

There is also no reason to adjust the pH of *Ruhlmann* based on the asserted teachings of *Rosenbusch*, because the chemistry of the dyes disclosed in *Rosenbusch* is different from the chemistry of the dyes in *Ruhlmann* for the reasons discussed above. Accordingly, the claimed processes are not disclosed in or suggested by the references cited against the claims.

Further, *Ruhlmann* discloses dyes at columns 1, 3-4, 5-6, and 7-8 that have only three azo groups ( $-N=N-$ ) in the molecular backbone. The claimed formulae that have three azo groups are formulae I (when m is 2) and IIb. When m is 2 in formula I, this formula requires the presence of a  $Kk^1$  group where all three azo groups are attached to this group. *Ruhlmann* fails to disclose or suggest any such dyes. In regard to formula IIb, the presence of  $Tk^1$  groups are required, and the *Ruhlmann* dyes do not have any groups that correspond to the  $Tk^1$  groups as claimed. Accordingly, none of the formulae for the claimed dyes encompass the compounds of *Ruhlmann*.

*Rosenbusch* fails to remedy these deficiencies of *Ruhlmann*, described above. As noted previously, *Rosenbusch* discloses processes of using acidic and basic dyes. These dyes

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<sup>3</sup> See page 6 of the Office Action.

are chemically different from the *Ruhlmann* dyes and therefore this cited reference is unrelated to *Ruhlmann*. The *Rosenbusch* dyes are also chemically different from the claimed dyes, and therefore there is no disclosure or suggestion of dyes in *Rosenbusch* that are encompassed by the present claims. Accordingly, the two cited references, individually or combined, fail to disclose or suggest all claimed elements. There is therefore no *prima facie* case of obviousness against the claims in view of the cited references (MPEP § 2143.03).

The Office continues to insist that the dyes represented by the claimed formulae in the claimed processes should not be given patentable weight. *See e.g.* page 16, second full paragraph of the May 16, 2011 Office Action. However, MPEP § 2116 clearly states (with emphasis added) that the "**materials on which a process is carried out must be accorded weight in determining the patentability of a process.**" *See also* MPEP § 2112.02, citing *In re May* (574 F.2d 1082; 197 USPQ 601), where the Court reversed a rejection of process claims where new compounds in view of the cited art were used. Accordingly, the claims are free of *Ruhlmann* and *Rosenbusch* because these cited references fail to disclose or suggest any dyes that are encompassed by dyes of the claimed formulae for the reasons discussed above.

Further still, the Office has failed to establish a *prima facie* case of obviousness against the claims despite the comments at section 8 of the Office Action. The Office concedes that *Ruhlmann* fails to disclose dyes as encompassed by the formulae as claimed, but considers that "one having ordinary skill in the art at the time the invention was made would expect that the similar structured dyes claimed in these claims would carry out the equivalent function of dyeing leather [as allegedly disclosed in *Ruhlmann*]." <sup>4</sup> However, the burden to make a *prima facie* case of obviousness based on presumed structural similarity requires "the expectation that compounds similar in structure will have similar properties." <sup>5</sup>

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<sup>4</sup> *See* section 8 of the Office Action, third paragraph thereof.

<sup>5</sup> MPEP § 2144.09(I.), emphasis added.

In Table 19 of the present application, Applicant has reported the dye color on leather for a large number of dyes that have different numbers of azo linker groups within the backbone of the molecule (*e.g.* the dye of dye 1a has two azo linkers). There are many colors reported for dyes of different molecular structure (*e.g.* different number of azo linkers in the molecular backbone). For example, the dye of example 10 has two azo linkers and exhibits a blue color on leather, while each dye of examples 11a and 11b has three azo linkers and exhibits a bordeaux color on leather. Thus, the dye-color changes for compounds between compounds that the Office considers to have similar structures, but Applicant has shown that such compounds do not have similar properties.

Accordingly, there is no expectation that the *Ruhlmann* dyes, which have three azo linkers, would exhibit a similar color as the claimed dyes because the claimed dyes have different molecular structures than the *Ruhlmann* dyes. Thus, the Office has failed to establish a *prima facie* case of obviousness of the claims based on the structures of the *Ruhlmann* dyes.

*Rosenbusch* does not remedy these deficiencies, because the dyes disclosed therein are acidic or basic dyes, not reactive dyes as in *Ruhlmann*. Thus, *Rosenbusch* fails to provide any teaching or disclosure that would suggest that the *Ruhlmann* dyes exhibit similar properties to the claimed dyes (which they do not).

Furthermore, there is no teaching, suggestion or motivation to modify the structure of the *Ruhlmann* dyes to have anything other than three azo linkers and  $Tk^1$  groups as claimed. As noted previously, the only structure of dyes disclosed in *Ruhlmann* are those of formula (1), which are dyes having only three azo linkers and no  $Tk^1$  groups. The Federal Circuit has articulated a three element test for a *prima facie* case of obviousness based on structural similarity of a lead compound to a claimed compound (see, *e.g.*, Procter & Gamble Co. v. Teva Pharms., USA, Inc. 566 F.3d 989, 90 U.S.P.Q.2D 1947 (Fed. Cir. 2009)). Among these

elements and assuming that one of ordinary skill in the art had a reason to select the *Ruhlmann* dyes as lead compounds to be modified, which Applicant does not concede, there must be a reason for a person of ordinary skill in the art to modify the *Ruhlmann* dyes. The cited references fail to provide any such reason, because *Ruhlmann* only discloses dyes having three azo linkers and discloses syntheses of compounds to make dyes having only three azo linkers. *Rosenbusch*, as previously noted, discloses a different class of dyes (acidic and basic) and therefore fails to provide any motivation to modify the *Ruhlmann* compounds. Thus, there is no reason to modify the *Ruhlmann* dyes to have anything but three azo linkers in the molecular formula, which compounds are not encompassed by the present claims.

For at least the foregoing reason, the Office has failed to establish a *prima facie* case of obviousness against the present claims.

Even if a *prima facie* case of obviousness were to exist, which it does not, Applicant can rebut such a case by presenting results that are not disclosed in or suggested by the cited references. Applicant has provided a variety of dyeing recipes for various substrates (*e.g.* shoe upper leather) beginning at page 155 of the specification. In the first recipe, the dye was fixed on the shoe leather during a time period of 60 minutes, and the resulting dye exhibited excellent wash-, perspiration-, migration-, and rubfastness. There is no disclosure or suggestion of such results in *Ruhlmann*, because this cited reference exemplifies and discloses the dyeing of cotton in Dyeing Instructions I-V. Thus, Applicant has disclosed results that are not disclosed in or suggested by the cited references.

There is no *prima facie* case of obviousness against the present claims and Applicant has disclosed results that are not disclosed in or suggested by the cited references.

Withdrawal of the rejection is respectfully requested.

3. The 35 USC § 112, second paragraph, rejection of claims 1 and 9 as set forth at paragraph 3 of the Office Action is respectfully traversed.

The Office continues to assert that independent claim 1 omits essential process steps. Specifically, the Office asserts that the dyeing step is missing from the claims. The leather is dyed by contacting the leather with a float comprising the dye(s) as claimed. Further, the present specification clearly states that dyeing proceeds rapidly when leather is contacted with an aqueous float having a specific pH and comprising the claimed dyes at, *e.g.*, page 3, lines 7-29, emphasis added and edited for clarity:

We have found that this object is achieved, surprisingly, on using dyes F, which have at least one functional group in the hereinbelow defined formula A, in an aqueous float at pH 7.5 or higher. In fact, dyeing and fixation proceeds so rapidly under these conditions that a short dyeing time of 4 h or less is sufficient to achieve adequate color intensity and a high fixation of 85% or more. ...

[The claimed processes comprise] treating the leather with an aqueous float comprising at least one dye F at a pH of not less than 7.5

Further, MPEP § 2171.02 states that a "claim does not necessarily fail to comply with 35 U.S.C. 112, second paragraph where the various elements do not function simultaneously, are not directly functionally related, do not directly intercooperate, and/or serve independent purposes." Accordingly, claim 1 is not indefinite because there is no explicitly recited step of, *e.g.*, adjusting the pH simultaneously with contacting the dyes with leather.

For the foregoing reasons, *the claims do not omit essential subject matter.*

Withdrawal of the rejection is respectfully requested.

4. The 35 USC § 112, second paragraph, rejection of claim 1 as set forth at paragraph 4 of the Office Action is respectfully traversed. The Office asserts the claim is unclear because the claim does not include a definition of an electron-attracting radical and fails to specify

what the Q groups are. The "meaning of every term used in a claim should be apparent from ... the specification and drawings at the time the application is filed."<sup>6</sup> The specification clearly provides meanings for these terms at, e.g., page 4, lines 6-12 (*see also* claims 42 and 3).

Withdrawal of the rejection is respectfully requested.

Obviousness-type double patenting rejection

The provisional rejection of Claims 1-7, 9, 11-12 and 19-20 under the judicially created doctrine of obviousness-type double patenting over claims 16-21, 23-29 and 31-40 of copending U.S. Application No. 11/628,659 (U.S. '659) is moot. Claim 1 has been amended to include limitations of claim 38, which claim was not included in the present rejection. Accordingly, claim 1 is free of this provisional ODP rejection for the same reasons claim 38 is free of this rejection.

Moreover, Applicants note MPEP § 804(I)(B.)(1.), which states:

If a "provisional" nonstatutory obviousness-type double patenting (ODP) rejection is the only rejection remaining in the earlier filed of the two pending applications, while the later-filed application is rejectable on other grounds, the examiner should withdraw that rejection and permit the earlier-filed application to issue as a patent without a terminal disclaimer.

If "provisional" ODP rejections in two applications are the only rejections remaining in those applications, the examiner should withdraw the ODP rejection in the earlier filed application thereby permitting that application to issue without need of a terminal disclaimer.

Applicants note that U.S. '659 is the national stage application of international application PCT/EP05/006107, which was filed on June 7, 2005 and entered the national stage on December 6, 2006. In contrast, the present application has *an effective filing* date of October 28, 2004, which is the date on which the international application of the present application

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<sup>6</sup> MPEP § 2173.05(a.)(I.).

was filed. Thus, the present application is earlier filed application, and the rejection under obviousness-type double patenting should ultimately be withdrawn upon satisfying the requirements described in the MPEP, quoted above.

Conclusion

Applicant respectfully submits that the above-identified application is in condition for allowance. Notification thereof is requested.

Respectfully submitted,

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# Reactive dye

From Wikipedia, the free encyclopedia

In a **reactive dye** a chromophore contains a substituent that is activated and allowed to directly react to the surface of the substrate.

## Contents

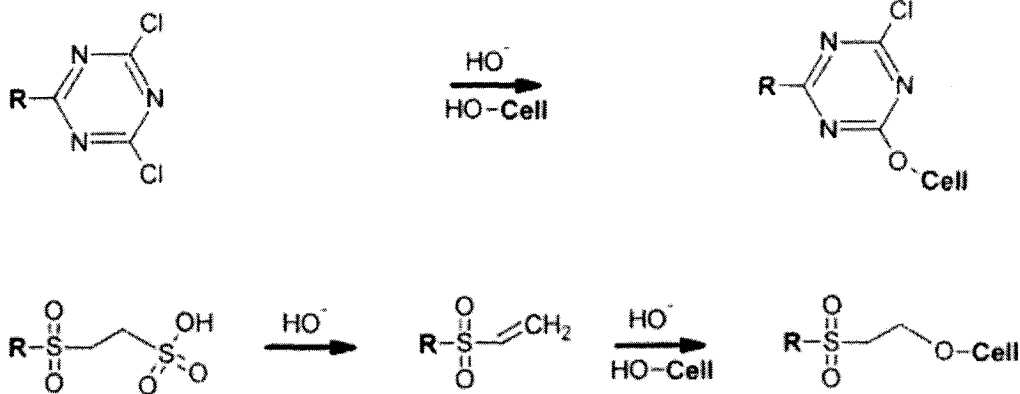
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## History

Reactive dyes first appeared commercially in 1956, after their invention in 1954 by Rattee and Stephens at the Imperial Chemical Industries Dyestuffs Division site in Blackley, Manchester, United Kingdom.

## Usage

Reactive dyes are used to dye cellulosic fibres. The dyes contain a reactive group, either a haloheterocycle or an activated double bond, that, when applied to a fibre in an alkaline dye bath, forms a chemical bond with an hydroxyl group on the cellulosic fibre.



**R** = Chromophore

**Cell** = Cellulose

Reactive dyeing is now the most important method for the coloration of cellulosic fibres. Reactive dyes can also be applied on wool and nylon; in the latter case they are applied under weakly acidic conditions.

Reactive dyes have a low utilization degree compared to other types of dyestuff, since the functional group also bonds to water, creating hydrolysis.

Reactive dyes are categorized by functional group<sup>[1]</sup>.

Functiona	Fixation	Temperature	Included in Brands
Monochlorotriazine	Haloheterocycle	80°	Basilen E & P Cibacron E Procion H,HE
Monofluorochlorotriazine	Haloheterocycle	40°	Cibacron F & C
Dichlorotriazine	Haloheterocycle	30°	Basilen M Procion MX
Difluorochloropyrimidine	Haloheterocycle	40°	Levafix EA Drimarene K & R
Dichloroquinoxaline	Haloheterocycle	40°	Levafix E
Trichloropyrimidine	Haloheterocycle	80-98°	Drimarene X & Z Cibacron T
Vinyl sulfone	activated double bond	40°	Remazol
Vinyl amide	activated double bond	40°	Remazol

## Bifunctional

Dyestuffs with only one functional group sometimes have a low degree of fixation. To overcome this dyestuffs containing two different reactive groups (i.e. one monochlorotriazin and one vinyl sulfone) were created.

Dyestuffs containing two groups are also known as bifunctional dyestuffs, though some still refers to the original combination. Other types of bifunctional dyes has been introduced. The first bifunctional dye made where more tolerant to temperature deviations (better process). Other bifunctionals are created, some with fastness (better quality) or only fixation degree (better environment/economy) in mind.

Reactive dyes have good fastness properties owing to the bonding that occurs during dyeing. Cotton is made of cellulose molecules which react with the dye. During reactive dyeing the H atom in the cellolose molecule combines with the Cl atom (in monochlorotriazin) in the dyeing process and results in a bond. Trifunctional dyestuffs also exist.

## See also

- Carbene dyes

## Footnotes

- <sup>^</sup> Stig Hjortshøj (1999), pp. 44–45.

## References

<http://www.indiamart.com/supremodyestuff/reactive-dyes.html> <http://www.indiamart.com/supremodyestuff>

## External links

For more info Fundamental Chemistry of reactive dyes ([http://www.pburch.net/dyeing/chemistry\\_reactivedyes\\_lesson.shtml](http://www.pburch.net/dyeing/chemistry_reactivedyes_lesson.shtml))

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Categories: Dyes

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# Acid dye

From Wikipedia, the free encyclopedia

An **acid dye** is a dye, in chemical regard a sodium (less often–ammonium) salt of a sulfonic, carboxylic or phenol organic acid. Acid dye is soluble in water and possesses affinity for amphoteric fibers while lacking direct dyes' affinity for cellulose fibers. When dyeing, ionic bonding with fiber cationic sites accounts for fixation of colored anions in the dyed material. Acids are added to dyeing baths to increase the number of protonated amino-groups in fibers.

Some acid dyes are used as food colorants.

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## Uses

### Fibers

In the laboratory, the home or art studio, the acid used in the dyebath is often vinegar (acetic acid) or citric acid. The uptake rate of the dye is controlled with the use of sodium chloride. In textiles, acid dyes are effective on protein fibers, i.e. animal hair fibers like wool, alpaca and mohair. They are also effective on silk. They are effective in dyeing the synthetic fiber nylon but of minimal interest in dyeing any other synthetic fibers.

### Medical

In staining for microscopic examination for diagnosis or research acid dyes are used to color basic tissue proteins in contrast to basic dyes, which are used to stain cell nuclei and some other acidic components of tissues.<sup>[*citation needed*]</sup>

## Description

Acid dyes are generally divided into three classes which depend on fastness requirements, level dyeing properties and economy. The classes overlap and generally depend on type of fiber to be colored and also the process used.

Acid dyes are thought to fix to fibers by hydrogen bonding, Van der Waals forces and ionic bonding. They are normally sold as the Sodium salt therefore they are in solution anionic. Animal protein fibers and synthetic Nylon fibers contain many cationic sites therefore there is an attraction of anionic dye molecule to a cationic site on the fiber. The strength (fastness) of this bond is related to the desire/ chemistry of the dye to remain dissolved in water over fixation to the fiber.

## History of acid dye

## Structures

The chemistry of acid dyes is quite complex. Dyes are normally very large aromatic molecules consisting of many linked rings. Acid dyes usually have a sulfo or carboxy group on the molecule making them soluble in water. Water is the medium in which dyeing takes place. Most acid dyes are related in basic structure to the following:

Anthraquinone type:

Many acid dyes are synthesised from chemical intermediates which form anthraquinone-like structures as their final state. Many blue dyes have this structure as their basic shape. The structure predominates in the levelling class of acid dye.

Azo dyes: The structure of azo dyes is based on azobenzene, Ph-N=N-Ph (see right showing cis/ trans isomers) Although Azo dyes are a separate class of dyestuff mainly used in the dyeing of cotton (cellulose) fibers, many acid dyes have a similar structure, and most are red in color.

Triphenylmethane related:

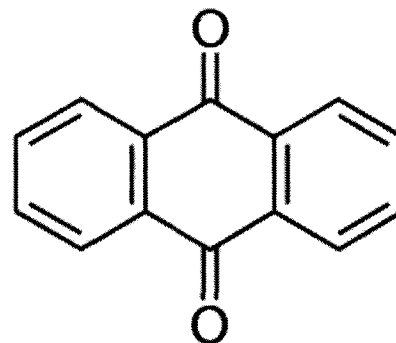
Acid dyes having structures related to triphenylmethane predominate in the milling class of dye. There are many yellow and green dyes commercially applied to fibers that are related to triphenylmethane.

## Classes of acid dyes

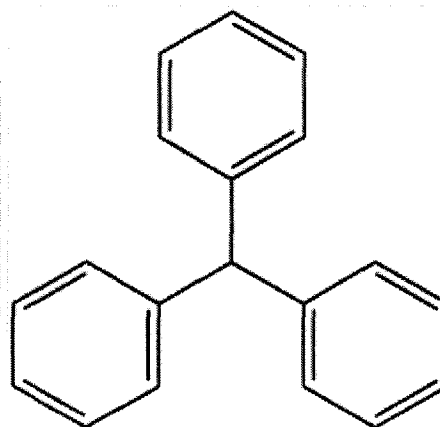
Equalising/levelling acid dyes: Highest level dyeing properties. Quite combinable in trichromatic shades. Relatively small molecule therefore high migration before fixation. Low wet fastness therefore normally not suited for apparel fabric.

Milling acid dyes: Medium to high wet fastness. Some milling dyes have poor light fastness in pale shades. Generally not combinable. Used as self shades only.

Metal complex acid dyes: More recent chemistry combined transition metals with dye precursors to



Anthraquinone



Triphenylmethane

produce metal complex acid dyes with the highest light fastness and wet fastness. These dyes are also very economical. They produce, however, duller shades.

## Health and safety

Any dyes including acid dyes have the ability to induce sensitisation in humans due to their complex molecular structure and the way in which they are metabolised in the body. This is extremely rare nowadays as we have a much greater understanding through experience and knowledge of dyestuffs themselves. Some acid dyes are used to colour food. We wear fabrics every day exposing our skin to dyes.

The greatest risk of disease or injury due to dyes is by ingestion or exposure to dye dust. These scenarios are normally confined to textile workers. Whereby the dye itself is normally non toxic, the molecules are metabolised (usually in the liver) where they may be broken back down to the original intermediates used in manufacture. Thus many intermediate chemicals used in dye manufacture have been identified as toxic and their use restricted. There is a growing trend among governments to ban the importation of dyes synthesised from restricted intermediates. For example: the dye CI Acid red 128 is banned in Europe as it was found to metabolise in the body back to ortho-toluidine, one of its chemical intermediates. Many intermediates used in dye manufacture such as o-toluidine, benzidine etc. were found to be carcinogenic. All the major chemical companies have now ceased to market these dyes. Some, however, are still produced but they are found to be totally safe when on the fiber in its final state. The use of these dyes is declining rapidly as cheap and safer alternatives are now easily available.

The incident concerning the dye Sudan 1 is an example of a suspected toxic dye finding its way into the food chain. Such incidents are extremely rare.

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Categories: Dyes

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